The Kentucky Geological Survey

WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

SERIES SIX
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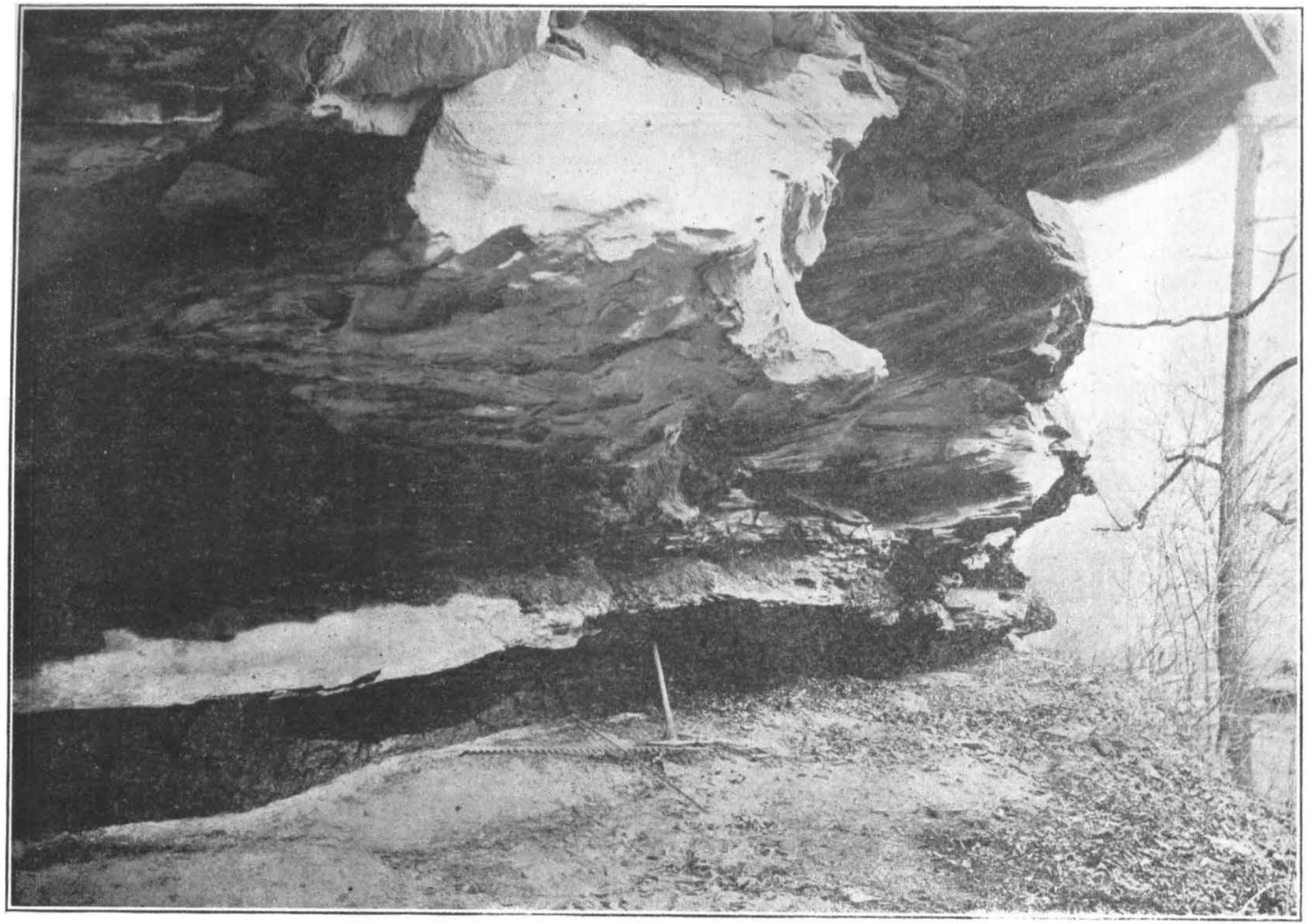
The Sixth Geological Survey
1921



THE WHITESBURG COAL AND SANDSTONE "ROCKHOUSE" ROOF.

This characteristic view of the well known Whitesburg coal and its superimposed thirty feet of cliff forming sandstone may be seen on Otter Creek just above its juncture with the Middle Fork of the Kentucky River in Perry County.

THE
SIXTH GEOLOGICAL SURVEY

An Administrative Report of the Several Mineral Resource and General Geological Investigations Undertaken and Completed in Kentucky during the Biennial Period 1920-1921

By

WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

PRESENTED WITH TEN SEPARATE MISCELLANEOUS GEOLOGICAL PAPERS

BY

GEORGE P. MERRILL,
STUART WELLER
WILLARD ROUSE JILLSON
STUART ST. CLAIR
AND
CHARLES STEVENS CROUSE

Illustrated with 101 Photographs Maps and Diagrams

First Edition

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PREFACE

Applied geology is of great economic value to every State in which natural resources are only partly developed. This is especially true of Kentucky where the great body of mineral resources are now less than 20% under commercial operation. An ideal arrangement would be one where the State would have completed the base (topographic) mapping and the preliminary geological-resource surveys prior to the opening up of any oil, coal, natural gas, asphalt or other field. During the period of proving up such a field, State employed geologists could well work hand in hand with the operators, and assist them greatly in their efforts to win the resources desired.

Unfortunately this ideal arrangement has never existed in Kentucky, though it has to some extent in other States. With only 46% of Kentucky base (topographic) mapped, and with an area approximating that of sixty counties not covered by any accurate maps at all, the function of the Kentucky Geological Survey has always been crippled and held in restraint. The day of a 100% efficiency of the Kentucky Geological Survey seems yet to be in the distant future.

During the last biennium a large number of subjects of great economic value to this State have been investigated, however, by the Kentucky Geological Survey. A full account of these investigations is presented herewith in the first paper of this volume entitled, "The Sixth Geological Survey." A number of these economic papers are included within the covers of this book, and should assist materially in an understanding of the geology and resources of the several regions covered. This report is issued in an original edition of one thousand copies.

W. R. Jillson

Director and State Geologist.

Old Capitol,
Frankfort, Kentucky.
December 15, 1921.

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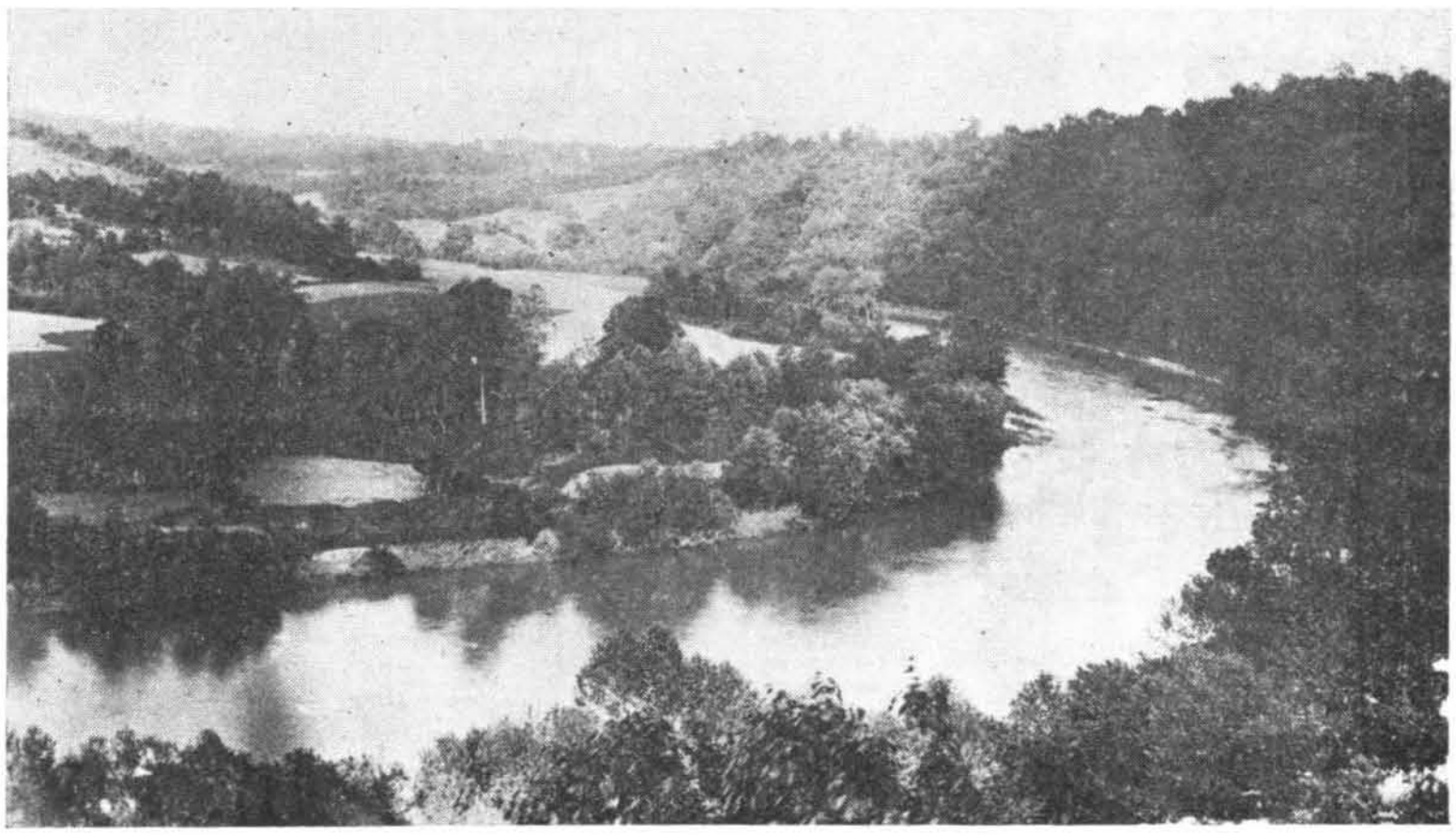
THE REGION ABOUT FRANKFORT.

By Willard Rouse Jillson.
Director and State Geologist.

INTRODUCTION.

Located on the Kentucky River in the southern central part of Franklin County, and in north central Kentucky, Frankfort* for 130 years the capital of the State, early attained and has continuously maintained an importance in the affairs of this Commonwealth considerably beyond that of other cities of its size. The corporation boundaries are included within 38° 11′ and 38° 13′ north latitude; 84° 51′ 30″ and 84° 53′ 30″ west



THE BEAUTIFUL KENTUCKY RIVER.
The view is a characteristic one near Frankfort looking up stream just below Cedar Run.

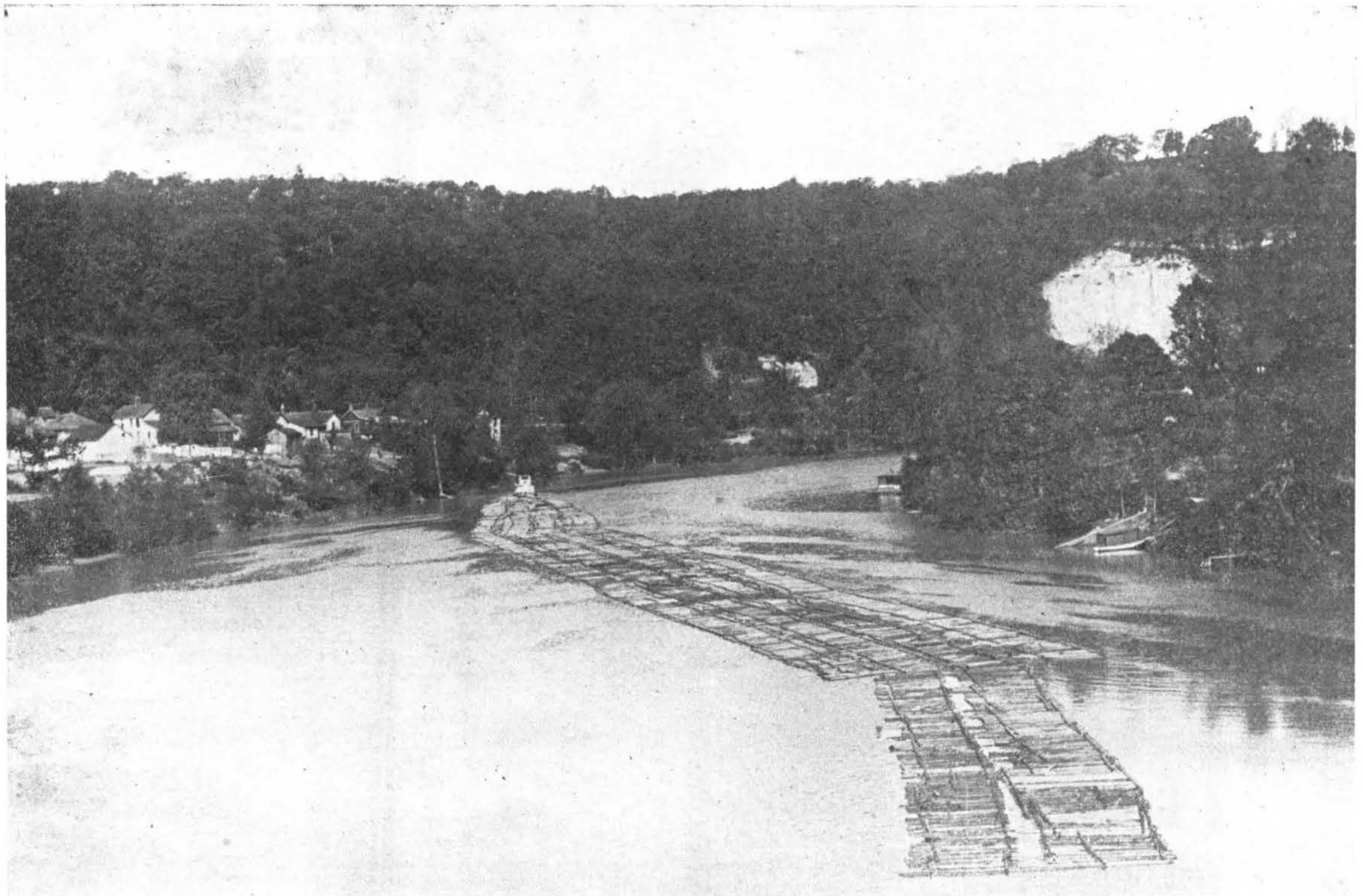
*Population 9,805, census 1920.

longitude. In an air line Frankfort is 49 miles almost due east of Louisville, and 22.5 miles northwest of Lexington. With these cities it is connected by an excellent, state-maintained, rock asphalt and surface treated, automobile highway—The Midland Trail. Other less important macadam roads leading from Frankfort are: the Lawrenceburg Pike (south), the Devil's Hollow Pike (west), the Bald Knob Pike (northwest), the Owenton Pike (northeast), and the Glenn's Creek Pike (southeast). The city is served by four railways: the Louisville and Nashville, the Chesapeake and Ohio, and the Frankfort and Cincinnati Railroads, and the Kentucky Traction and Terminal Company, an interurban trolley connecting Frankfort with Lexington.

Divided by the Kentucky River, which is spanned between St. Clair and Bridge Streets by a steel arched bridge erected in 1893, and rebuilt in 1921, the principal divisions of the City have come to be known as North and South Frankfort. The former is the older in point of settlement and is largely devoted to retail shops and manufacturing industries, while the latter is of comparatively recent expansion, and given over almost entirely to residential purposes. The old State House and its separate east wing are located in North Frankfort, facing Broadway, while the old Governor's Mansion and the State Reformatory, facing High Street, occupy several blocks from Ann Street on the west to Thomas street and the F. and C. Railroad yard on the east. The new Capitol and the new Governor's Mansion are situated south of the Kentucky River at the head of Capitol Avenue, the central subjects of a broad landscaped terrace. Within the Frankfort corporation limits, but west of the river and north of Benson Creek, is located Bell Point, while Leestown, just north of Fort Hill, and Thorn Hill, a mile northeast of the same physical promontory, are sparsely populated suburbs dependent upon the city.

PHYSIOGRAPHY.

The natural surroundings of Frankfort, the high, forest-clad hills, the craggy limestone precipices, the gracefully winding Kentucky River, describing a perfect letter "S" within the corporation, are the most picturesque and delightful of any city in the State. The country pikes leading out of the town have a



WOODED HILLS AND LIMESTONE CLIFFS.

The view is down stream (West) from the St. Clair Street Bridge and shows well the contrast of lowland and upland about Frankfort. Long tows of rafted logs are frequently to be seen.

quaint southern and scenic charm that the traveler will not fail to note and appreciate. In the spring the dainty red bud in bloom on Buttimer's and the South Frankfort hills is a visual treat long to be remembered, while the solid green of the mid-summer shade trees along quiet old-fashioned residential streets, and the variegated russets and reds of the autumnal period, draped by the inspired hand of nature over the gray crags above the river and the bold cliffs of Fort Hill, afford natural contrasts as pleasing as they are diversified.

Back of the scenic and picturesque which serves to delight the eye of the traveler in Frankfort is a story of physical changes in the topography and drainage of the region that is not generally known. The city proper is located on the bottom lands of a double meander in the gorge of the Kentucky River. Elevations of 500 feet above the sea level are common in these lowlands, while the broad undulating plateau immediately surrounding attains an elevation of 750 feet and upwards. There is thus produced a physical relief in the Frankfort vicinity of approxi-

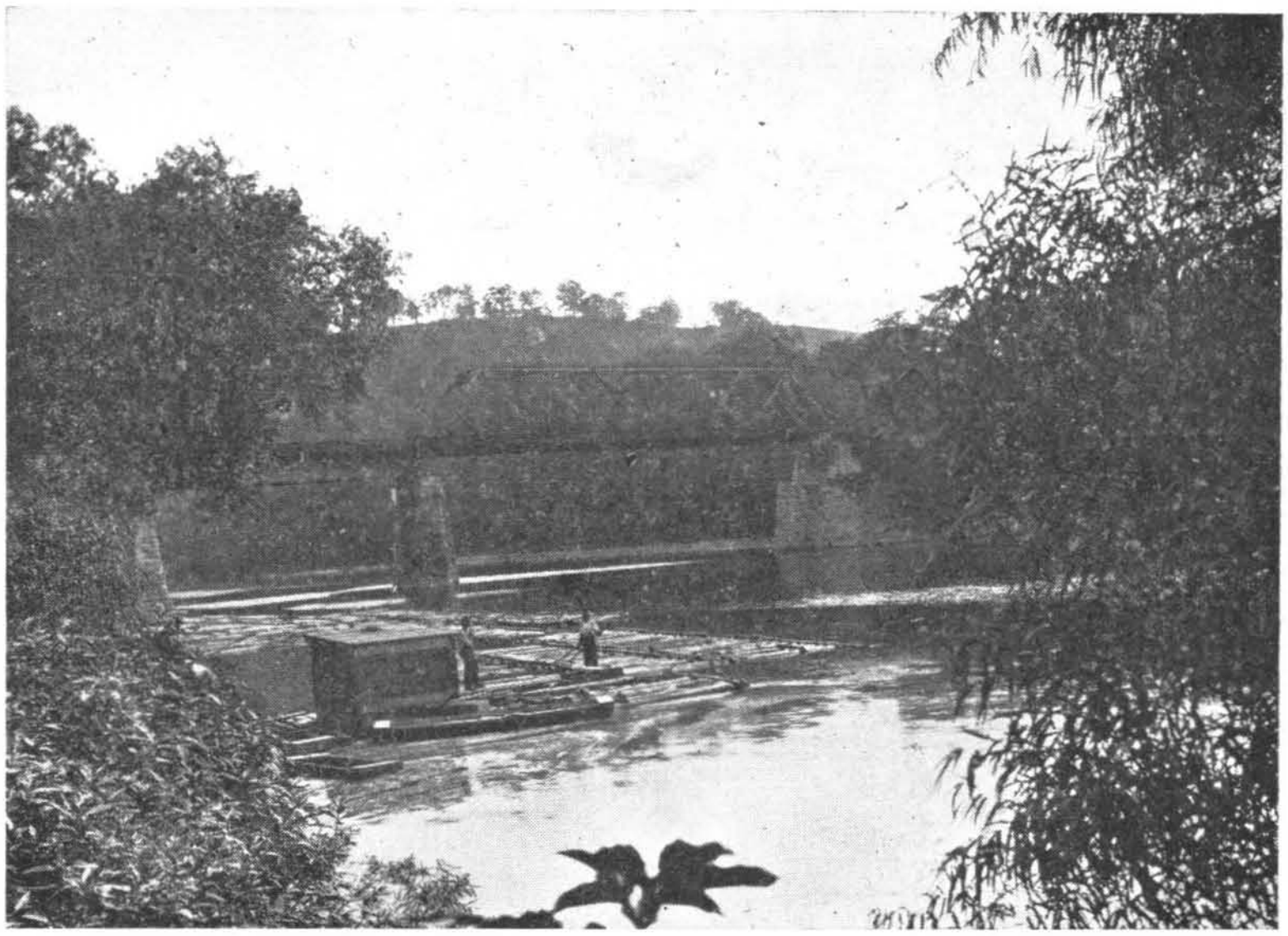
RIVER INDUSTRIES AT FRANKFORT.

The improvement of the Kentucky River has resulted in the development of a considerable water traffic, in both North and South Frankfort. South Frankfort on the right is situated on the inside of an oil meander of the Kentucky River.

mately 250 feet. Fort Hill, singularly isolated, and 785 feet high, challenges attention at the first glance. Though it will not be suspected, there is hidden in the correct solution of the origin of this giant outlier of bedded Ordovician limestone, the key to the physiography of the whole Frankfort region.

The caprices of a river, ever a fruitful study for those interested in the earth's sculpture, are responsible for the peculiar topographic conditions found at Frankfort. Could we but go back to middle Tertiary times and stand somewhere on the State cemetery hill, the view would be quite different from that which greets the sightseer of today. There almost at our very feet, slowly winding its meandering course towards the sea, we should find the Kentucky River, the central drainage artery of a great broad valley plain. A river, then much the same in size as the Kentucky of today, though sluggish because of its base leveled condition, the scene would have been quite different topographically from that which greeted the eye of the first explorer, or the present day sightseer for there were no cliffs or scarps at that time, and the deep gorge of the Kentucky River as we know it now was yet to be carved. The general figure of the channel, however, was much the same, except that the river itself turned sharply to the east just below the Devil's Hollow, and found its course on through the flat bottoms towards what is now known as Thorn Hill. Benson Creek, which came down close to the Kentucky River at Bell Point, did not enter it here, but continued on and found its mouth at this early time just northeast of Leestown, and at a later period, below Lock No. 4, and just west of the present site of the O. F. C. Distillery.

Events transpiring during the latter part of the Tertiary period in the nature of a great structural uplift of central and eastern Kentucky served to rejuvenate the old Kentucky River and gradually brought about the present character of the topography for which the region is widely noted. Simultaneously with the uplift of the Frankfort area, the Kentucky River set about its newly appointed task of entrenching itself into the more or less soluble Ordovician limestone. Later it took up the work of lateral expansion of its gorge. The whole region of South Frankfort has at times remote, been the changing bed of



A PEEP OUT THROUGH THE WILLOWS.

There is much that is picturesque about Frankfort. The gorge of the Kentucky River is well defined here as one looks upstream across the L. & N. Railroad Bridge.

the river, which from the time prior to its entrenchment had made a sharp turn to the northeast over North Frankfort. In the course of lateral expansion of the gorge by the growth of sharply curved meanders, a very pronounced bend came to be developed in the Kentucky River bed in the region of North Frankfort known as "Craw." This meander extending outward laterally to the northwest, met the strong and somewhat comparable yet smaller meander of Benson Creek, extending itself outward to the southeast. The ultimate result of these migrations was the removal by erosion and solution of the narrow isthmus of limestone connecting Buttimer's Hill with Fort Hill.

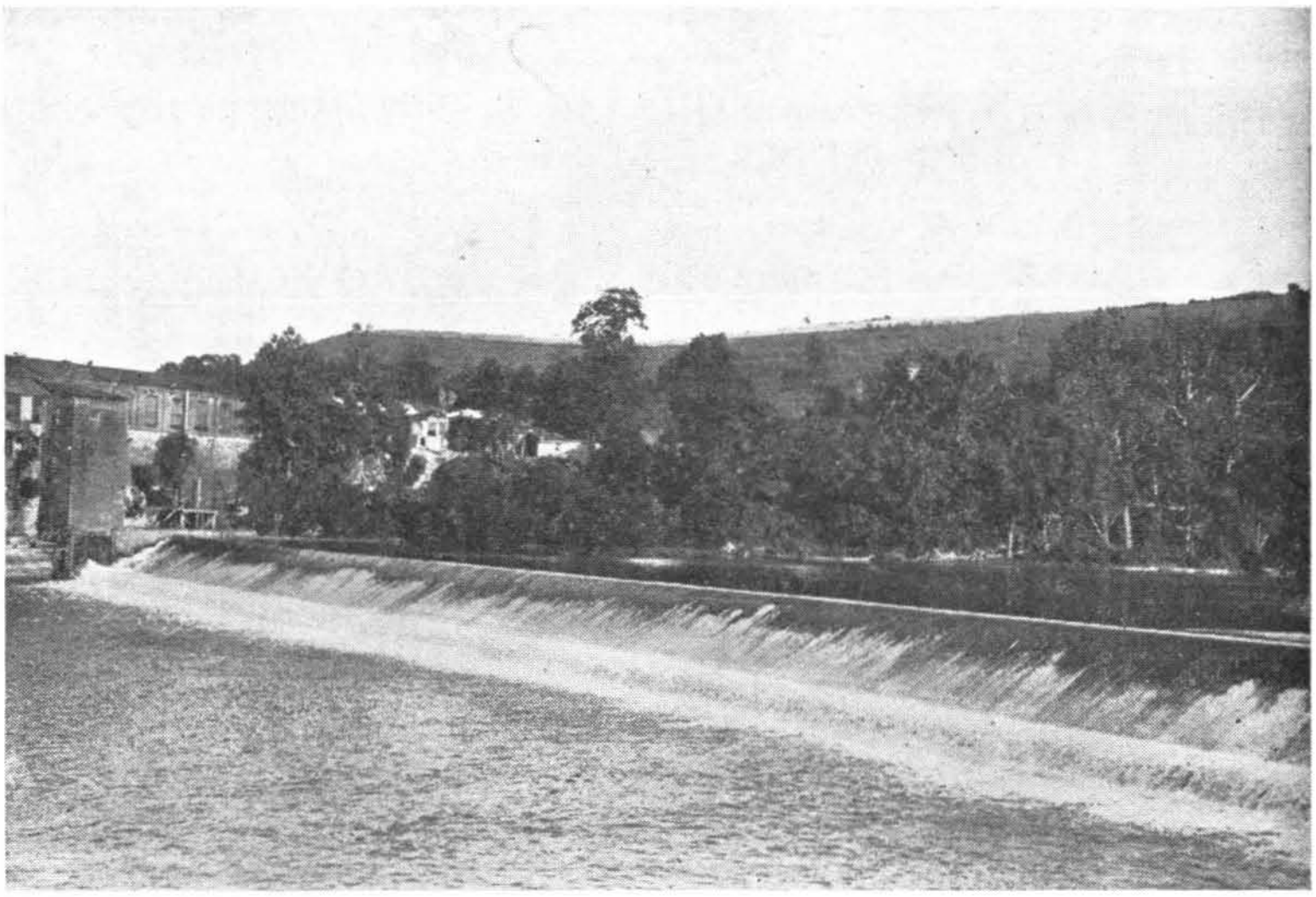
With a limestone natural bridge existing perhaps for a while under which the high tides of the Kentucky River first found passage into the lower reaches of ancient Benson Creek, as is now the case at points on the Cumberland River in Kentucky, the normal and main body of the river continued to flow for a

time in its old course around through the low flat bottoms of the Thorn Hill meander. At this time the bed of the Kentucky River was slightly less than 500 feet, as is shown by the present excavations for the new Frankfort drainage canal in the abandoned river bottoms of the Thorn Hill meander, where residual limestone clays have been encountered at the very shallow depth of four feet. The old course of the Kentucky River through the Thorn Hill meander as well as the general topography and geography of the Frankfort region is clearly indicated on the new topographic map of Frankfort and vicinity. This map which is here presented for the first time, has but recently been completed by the U. S. Geological Survey and the Kentucky Geological Survey working in co-operation. The map shows elevations in standard brown contours, culture and geographic boundaries in black, streams in blue and the Midland Trail in red. The scale is 1-24,000.

In the course of time the limestone barrier connecting Buttimer's Hill with Fort Hill was entirely removed, and seeking the shorter course, the river appropriated the lower portion of Benson Creek and gave up forever the old Thorn Hill meander. In making this change, it assumed the somewhat accelerated gradient of lower Benson Creek, with the result that shoals and rapids were developed between the present mouth of Benson Creek and what is now Lock No. 4. Prior to its improvement by the Federal Government, the fall in this portion of the Kentucky River was seven feet. At this same time "Fish Trap Island" over half a mile in length extended down the river from the mouth of Benson Creek.*

It was the occurrence of the pronounced shoals in the vicinity of Leestown in an otherwise ordinarily deep river that brought the buffalo to this point for a crossing. These same shoals stopped the McAfee-Taylor party en route up the river in July, 1773, and induced them to explore and complete a six hundred acre survey of the present site of Frankfort.** Subsequently it was the well defined buffalo wallow or trace which brought the early explorers to this point in Kentucky, and resulted in

*History of Franklin County Johnson, 1912, p. 35.
**History of Franklin County, Johnson, 1912, p. 28.



FEDERAL DAM AT LOCK No. 4.
It was just below this point that the Leestown Shoals occurred which determined the early settlement of the Frankfort Region. Fort Hill is in the background.

the settlement of Leestown long before Frankfort as a townsite was seriously considered.

The first settlers of Frankfort found the topography of the bottom lands of what is now the northern part of this city much different than it is today. All of that section known as "Craw" was a low swale, which annually filled with back-water and vegetable rubbish brought down by the floods of the Kentucky River. This was the re-entrant of the old channel which today has been filled in upwards of 50 feet with all kinds of city rubbish and refuse. It is said that while drilling a water well on the "Gas House" plot some 50 years ago at a depth of 60 feet, the dirt auger used, encountered and brought to the surface a large portion of an old walnut log, thereby indicating that the scour of the old river had at this point at least, reached considerable depth.

In the early days in the vicinity of what is now the east end of the L. and N. railroad station, and extending slightly southwestward beneath where now stand the Frankfort Motor Com-

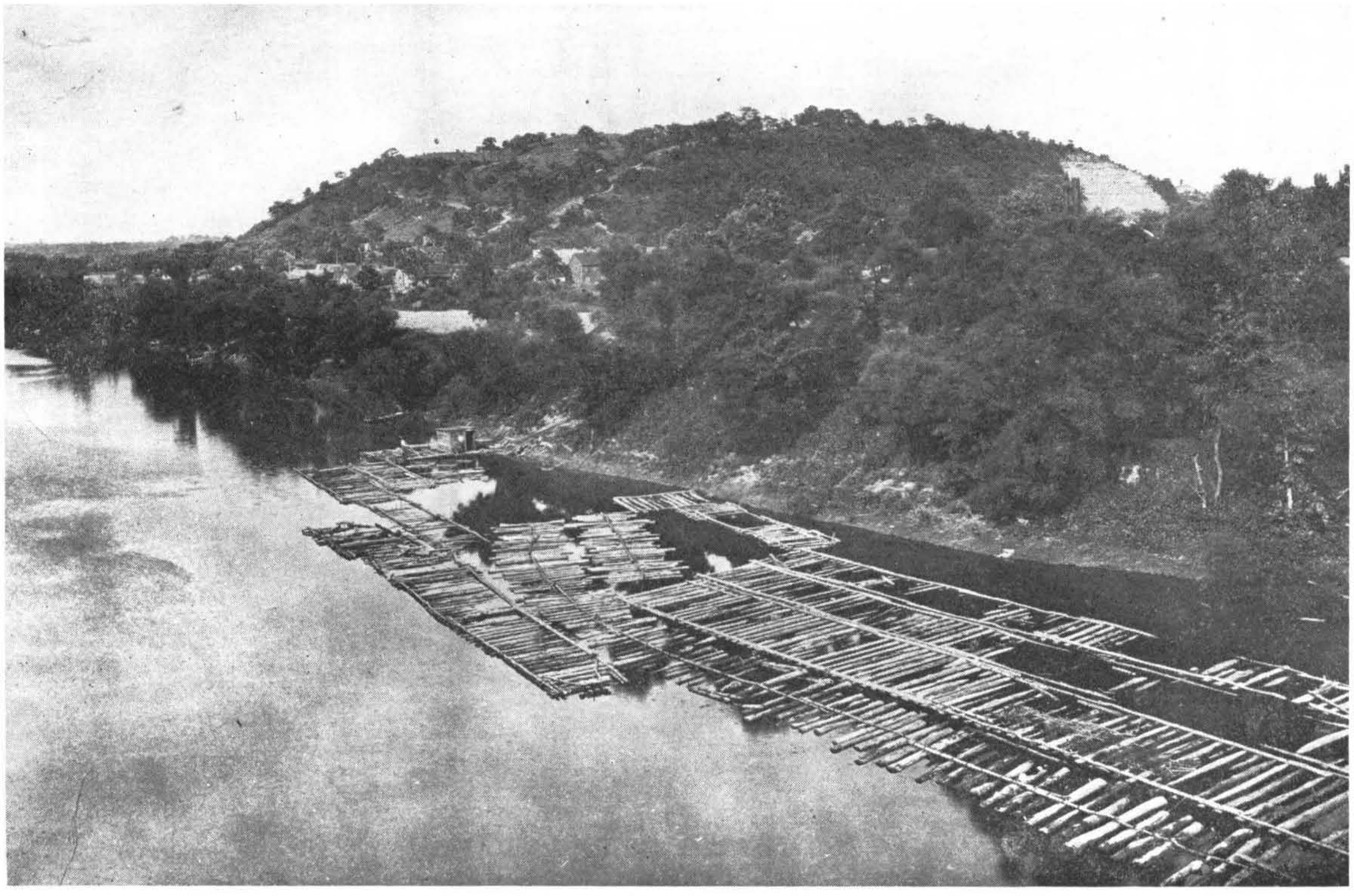
pany garage and Manford's Livery Stable, was a deep crevice in the Ordovician limestone, through which a considerable portion of the river waters passed in a "cut off" to the north. This "cut off" connected the river from its present location in the vicinity of Manford's stable with the opposite side of the North Frankfort meander in the vicinity of the State Reformatory. Old residents of Frankfort well remember the trace of this limestone fissure, and during recent excavations for building purposes, an old log pen which had been built during early times to keep cattle from falling into an open sink-hole of this fissure, was discovered buried at a considerable depth. During periods of low water this fissure has been measured at a number of places, and found to be from 5 to 7 feet in width.

In reflecting on the changes in the course of the Kentucky River in the vicinity of Frankfort, it is interesting to recall the disastrous Kentucky River flood of 1883 which filled as a backwater the Leestown branch to the State Reformatory, where it joined a similar eddy which had advanced over "Craw" and made a typical island out of Fort Hill.* In doing this the river demonstrated its claim to the broad Thorn Hill bottoms and repeated before the eyes of thousands of astonished and alarmed spectators the physiographical history of the Frankfort region. A further point of interest is that today the city of Frankfort is endeavoring to reconstruct in the valley filled Kentucky River bottoms leading from the city through the Thorn Hill meander, a new drainage channel, which it is hoped will be an improvement over the natural embarrassed drainage of this section, and redirect the waters of this lowland region more rapidly to the river below Leestown in the same direction which the old river once pursued.

GEOLOGY.

The geology of the Frankfort section is relatively simple. The section which is lower Ordovician is one of orderly sequence and almost horizontally deposed. It has been worked over by a number of geologists, Dr. David Dale Owen in 1857 having prepared the first report. Each of the workers in this region has contributed to the knowledge of the local geology. All of the beds exposed are limestone or shaly limestone, the lowest being what is

* History of Franklin County, Johnson, 1912, p. 30.



THE GREAT ORDOVICIAN OUTLIER, "FORT HILL."
The Kentucky River is here flowing to the left (North) through the Benson cut off. Originally it turned to the right (East) close under the Fort Hill cliffs and completed the Thorn Hill meander.

known as Tyrone limestone, which is of Stone's River (Black River) age. The uppermost is the Cynthiana formation, found on the top of Fort Hill. Higher beds, not exposed in the immediate vicinity of Frankfort, may be found in all directions, somewhat removed from the townsite and the river. The geological section from the Curdsville to the Perryville inclusive is of Trenton age. The several limestone formations shown in superimposed order and maximum local thickness are as follows:*

GEOLOGICAL SECTION AT FRANKFORT, KY.

Champlainian	Cynthiana (basal portion only exposed)	60
	Perryville	25
	Flanagan	45
	Bigby	75
	Wilmore	80
	Hermitage	45
	Curdsville	10
	Tyrone(upper portion only exposed)	60
	Total of all maximum thickness	**400

The attitude of the beds of limestone in the Frankfort region appears to be nearly horizontal, though the regional dip is slightly to the northwest. Local dips of very small degree and continuance may be found in most any direction. There are no mineral veins of commercial importance intersecting the area so far as known, though small fragments of calcite, barite and fluorspar have been found very close to the city. The limestones outcropping in the bluffs of the gorge are used for road making and building construction purposes with little discrimination as to their occurrence. The best building stone of the section, however, is the white, hard Tyrone ("Birdseye"), a silicious limestone, which has received the trade name of "Kentucky River Marble." It was used in the construction of the old State House in 1828, and in much of the business and residential building construction of from 50 to 70 years ago. Today it finds its chief use in ornamental construction purposes for residences, retaining walls, etc.

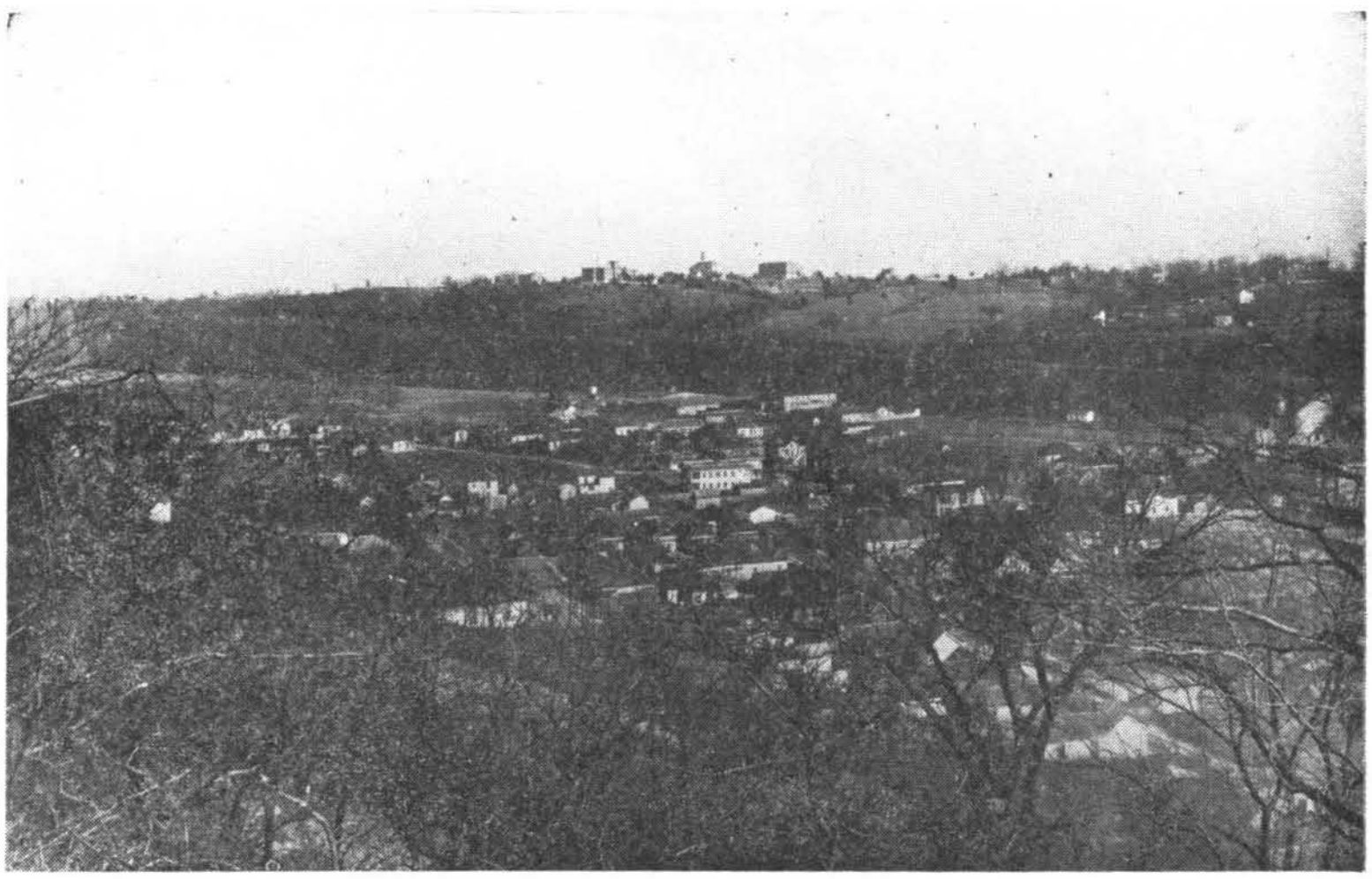
*Geology of Franklin County, Ky. Miller. Ky. Geol. Survey, Series IV, 1914, p. 19. (Adapted.)

**A measurement of the total section at Frankfort shows considerably less than 400 feet due to the thinning of some members.

PANORAMIC VIEW OF FRANKFORT TOPOGRAPHY.

The view is from the Louisville road near the new Capitol. On the right is the present course of the Kentucky River, on the left the old course, in the center Fort Hill.

In summarizing the geologic history of the Frankfort area, it is interesting to note that the final abandonment of the old channel from Thorn Hill to the river occurred in comparatively recent times, geologically speaking. Though this time cannot be accurately expressed in years, it was probably not less than 5 or more than 15 thousand years ago. Following the abandonment of the old Thorn Hill meander, the river continued to degrade its channel, while the old bottoms became a back-water or swale. This continued for a long time, while the amount of erosional deposit from the hills surrounding and the back-water silt slowly grew in thickness. Yet today this recent deposit is relatively very small, totaling less than 10 feet at the most.



THE ABANDONED THORN HILL MEANDER.
The view is from Fort Hill looking southeast across the old river bottoms new Frankfort.

The location of Frankfort as a city was brought about by the somewhat uncommon geological phenomena of deeply incised meander channel abandonment Had this not occurred, there would never have been enough room in the gorge of the Kentucky River for the location of this city. But for this factor the important shoals from Benson Creek to Leestown would not have been developed, the buffalo would not have driven their

trace across it, and the exploring white man would not have found it his most convenient place of fording on his wilderness pilgrimages across the State. The settlement of Frankfort is more recent than that of Lexington and Louisville in point of years, but the geologic causes which made Frankfort possible are older than history.

The End.

DEPARTMENT OF THE INTERIOR
ALBERT B. FALL, SECRETARY
U.S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

TOPOGRAPHY

KENTUCKY GEOLOGICAL SURVEY
WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

KENTUCKY
(FRANKLIN COUNTY)
FRANKFORT AND VICINITY

84°53′ 52′ 84°51′ 38°13′ 12′ 38°11′

OWENTON PIKE
LOCK NO 4
Leestown
Thorn Hill
Bell Point
BALD KNOB PIKE
KENTUCKY RIVER
ELECTRIC R R
FORT HILL
Benson Ck
L & N
CINCINNATI AND
FRANKFORT
OLD CAPITOL
PEN
BM 511
BM 512
FRANKFORT
Buttimer Hill
DEVILS HOLLOW PIKE
MIDLAND TRAIL
TO LEXINGTON
MIDLAND R R
678 ELECTRIC
GLENN CREEK
CEMETERY
706
PIKE
South Frankfort
TRAIL
TO LOUISVILLE
737
NEW CAPITOL
LAWRENCEBURG PIKE

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1921

Scale 1/24 000
0 ½ 1 Mile
0 ½ 1 Kilometer

Contour interval 20 feet.
Datum is mean sea level.

ENGRAVED 1921 BY U.S.G.S.

C.H. Birdseye, Chief Topographic Engineer.
W.H. Herron, Division Topographic Engineer.
Topography by R.L. Harrison.
Control by B.H. Yoakum, J.R. Ellis, and C.H. Semper.
Surveyed in 1921.

Polyconic projection. North American datum.

SURVEYED IN COOPERATION WITH THE STATE OF KENTUCKY.

FRANKFORT AND VICINITY.
Edition of 1921.